instruction manual

1000

Sorensen

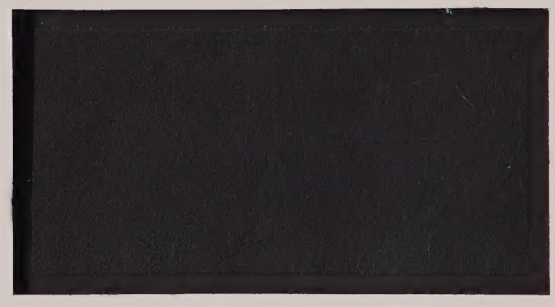
Sorensen & Company, inc.

Richards Avenue

South Norwalk, Conn.

MANUA

7 FEB 1969



BETA ELECTRIC CORP.,

NEW YORK 29, N. Y.

INSTRUCTION MANUAL

SERIES 1000

BEFORE YOU BEGIN TO USE YOUR NEW βETA INSTRUMENT, WE SUGGEST THAT YOU READ THIS INSTRUCTION MANUAL VERY CAREFULLY. THE INFORMATION CONTAINED HEREIN IS DESIGNED TO HELP YOU OBTAIN THE MAXIMUM IN PERFORMANCE AND MANY YEARS OF DEPENDABLE SERVICE FROM YOUR INSTRUMENT.

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5/1/58

SCOPE AND SPECIFICATIONS

This is an instruction manual for all βeta Electric Series 1000 Power Supplies for the Research & Development (R&D) designs less optional features. Information and specifications with regard to the optional features (M, L2, C2, etc.) can readily be obtained by referring to the Product Data Sheet enclosed.

SECTION I. GENERAL SERVICE & WARRANTY INFORMATION

A: SHIPPING DAMAGE:

The instrument should be inspected and tested immediately upon arrival. In the event the unit fails to operate properly or is damaged in any way, the carrier should be notified at once. When the claim agent has inspected the shipment and prepared a report of damage, a copy of this report should be sent to us. At that time we will advise you concerning the repair or replacement of the instrument.

B: SERVICE AND INFORMATION:

All questions concerning the operation or malfunctioning of this instrument should be directed to our representative in your immediate area. A listing of our representatives can be found on the inside cover of this instruction manual.

I M P O R T A N T

BE SURE TO INCLUDE THE MODEL AND SERIAL NUMBER IN ALL CORRESPONDENCE CONCERNING THIS INSTRUMENT. WITHOUT THIS INFORMATION WE WILL NOT BE ABLE TO GIVE YOU PROMPT SERVICE.

Should you receive a defective or damaged instrument or require service on an instrument in or out of warranty, please contact our representative. Be sure to include as much information as possible concerning the difficulty. This information should include symptoms, application etc. The more information you give us, the faster we can determine the extent of your difficulty.

In each case our representative will decide whether the instrument requiring service will be: (a) serviced at your plant by them. (b) shipped to a service station, or (c) returned to the factory.

If the instrument should be returned to the factory, we will send you a Shipping Release and a Service Tag which should be filled out and affixed to unit. DO NOT SHIP A UNIT TO THE FACTORY WITHOUT THIS TAG (Unless specific authorization has been received to do so).

C: SHIPMENTS:

All shipments to βeta must be prepaid unless we authorize to the contrary. The power supply should be wrapped in heavy paper and

packed in the original container or a wooden box with at least three inches of shock absorbent material on all sides. In oil insulated units, do not ship the unit with oil.

Make certain all tubes, if any, are removed and shipped separately. All movable objects such as tube plate caps, solenoids, etc. should be fastened securely.

All meters must be shorted.

Please return instruction manual with unit to be repaired.

D: WARRANTY:

This instrument is warranted by the βeta Electric Corp., to be free from defects in material and workmanship. Our obligation to the original purchaser under the warranty is limited to servicing the instrument and replacing defective parts, with the exception of tubes on which there is only the manufacturer's guarantee. This guarantee is valid only if the instrument has not been abused mechanically , and the operational limitations prescribed in instruction manual have been adhered to.

The period of warranty is one year after the date of delivery of the instrument to the original purchaser.

Defects caused by improper operating conditions, accidents, misuse, or negligence, and the removal of the serial plate, will void the warranty.

* *

SECTION II - GENERAL DESCRIPTION

The βeta Electric Series 1000 air and oil insulated power supplies, 0-1000 to 0-60,000 volts, at currents ranging from 1 ma at 60,000 volts, to 500 ma at 1000 volts, limited by a power rating of 600 watts output, have been specifically designed to provide reliable, safe, high voltage breakdown testers, for insulating materials and television components. B + sources for power tubes or cathode ray tubes, etc. with unusually long life. A noteworthy feature of this series is the ability to surge the high voltage at any magnitude of high voltage and current output.

They are also applicable to any requirement where no more than 600 watts of high or very high voltage ** dc power is needed, such as nuclear

* *

** VOLTAGE RANGE	AT LEAST (VOLTS)		BUT LESS THAN (VOLTS)
LOWEST OUTPUT	200	TO	300 V.
MEDIUM	300	TO	3,000 V.
MEDIUM HIGH	300	TO	10,000 V.
"HIGHER VOLTAGES"			
~~HIGH~~	~~3,000~~		
VERY HIGH	TO 30,000		
~~ULTRA HIGH~~	~~300,000 and above~~		

physics research, electrostatic painting and precipitation, cathode ray oscillography, etc. Attention has been given to safety without a sacrifice of any convenience in operation. Primary safety features include an overload relay and an automatic output voltage shorting solenoid.

1: ENGINEERING DESIGN:

The βeta Electric Series 1000R&D design is the basic standard design for voltage and current, incorporating such features as fine high voltage control, (-F); triple range load current meter , (-M3); etc. described in detail in the Product Data Sheet enclosed.

2: HIGH VOLTAGE CIRCUITS:

The circuit employed is either:

a: Full-wave doubler.
b: Full-wave rectifier.

The circuit for a particular supply is shown in the schematic circuit diagram βc-1000-1. (See Section V re: drawing nomenclature).

3: POLARITY REVERSAL is effected by changing the positions of a set of plugs inside high voltage section. These plugs are accessible by removing the safety shield cover.

4: OUTPUT VOLTAGE CONTROL is by means of a covat* which varies the ac input to the high voltage transformer rectifying circuit. The filaments (when tube rectifiers are used) are continuously energized by separate transformers, thus allowing continuous control of the output voltage.

5: METERING: The output voltage and current are metered, with multiple ranges available in all designs, per Product Data Sheet. Special features of an electrical, metering or control nature are available and listed in the Product Data Sheet.

6: CONTROLS:

1: HIGH VOLTAGE OFF AND OVERLOAD RESET pushbutton. (LOWER RT.
2: HIGH VOLTAGE ON pushbutton. (ABOVE #1)
3: HIGH VOLTAGE CONTROL covat*.
4: METER POLARITY SELECTOR switch.
5: MAIN POWER toggle switch.
6: FINE HIGH VOLTAGE control covat* (BELOW #3)
7: OUTPUT CURRENT METER RANGE selector switch.
8: ZERO START INTERLOCK BYPASS pushbutton. (UPPER RT
9: OVERLOAD TRIP CONTROL rheostat. (UPPER LFT.)
10: OUTPUT VOLTAGE meter range selector switch.

* COVAT - COntinuously Variable Auto Transformer; i.e. powerstat, variac.

7: PILOT LIGHTS: (ALL NEON WITH FROSTED LENS)

1: MAIN FUSES open (2).
2: OVERLOAD.
3: HIGH VOLTAGE ON.
4: HIGH VOLTAGE INPUT TRANSFORMER FUSE BLOWN.
5: EXTERNAL INTERLOCK OPEN.
6: MAIN POWER.

8: POWER CONNECTIONS:

1: INPUT: Standard recessed 2-pronged male receptacle, with 6 ft. line cord. (IN REAR)
2: OUTPUT: RG 8/U cable, 8 ft. long. (GOOD TO 5 KV IF SHIELD IS POSITIVELY GROUNDED)
3: GROUND: Screw binding post.

9: AUXILIARY FEATURE:

Standard 2-pronged convenience outlet, energized when the input is energized. (IN REAR)

* * * *

into the tank.

a: Lower the high voltage components slowly into the oil, in order to minimize splashing and oil aeration.
b: Refasten and replace tank in chassis.
c: Connect the control section to the tank by means of the interconnecting cable.
d: Reset front panel.

6: Remove the shorting wires from the meters.

7: Wire an external interlock, closed in the SAFE position, across pins of an ordinary 2-pin wall outlet plug that mates with the socket, on the chassis rear labelled FOR EXTERNAL INTERLOCK.

8: IMPORTANT:

Before replacing the safety shield cover, check the unit electrically by following OPERATING INSTRUCTIONS - ELECTRICAL, (STEPS 1-10). If the unit operates satisfactorily, replace the safety shield cover and mount as desired. (EXTRA SAFETY GROUND BOLTS HAVE BEEN ADDED TO SIDE OF CHASSIS)

B: ELECTRICAL:

1: Ground the unit by means of the binding post provided on the rear of the chassis.

NOTE: ALWAYS OPERATE WITH A GOOD EXTERNAL GROUND. ///

BE CERTAIN THAT ALL PERSONNEL ARE PROPERLY PLACED WITH RESPECT TO THE HIGH VOLTAGE OUTPUT CABLE. THIS MEANS THAT NO ONE SHOULD BE WITHIN 1/2 FOOT OF THE OUTPUT END, UNLESS HE KNOWS EXACTLY WHAT HE IS DOING.

DANGER: ALTHOUGH A LETHAL AMOUNT OF POWER MAY NOT BE AVAILABLE FROM THE POWER SUPPLY ITSELF, SECONDARY MECHANICAL EFFECTS DUE TO MECHANICAL MOVEMENT CAN BE DANGEROUS. ALSO, IF A CAPACITANCE IS BEING TESTED AT VOLTAGES SUCH THAT $1/2\ CE^2$ IS GREATER THAN 27, A LETHAL AMOUNT OF STORED ENERGY MAY BE AVAILABLE. (1).

(40 TO 60 MILLISECONDS ARE STORED IN L-2 RIPPLE FILTER IF LETHAL AMOUNT OF STORED ENERGY)

2: Connect output cable to load in such a position that it will not be in close proximity to ground. Keep away from all personnel!!

NOTE: High voltage output cables for units below 30 kv are terminated in alligator clips, while those for oil units are stripped back but remain unterminated.

3: Turn the HIGH VOLTAGE CONTROL to zero. Check that the MAIN POWER switch is in the OFF position.

4: Connect the power supply to a source of nominal 117 volts or 220 volts (2-6-1) feature only, 50/60 cycles, single phase, by means of the line cord provided.

(1) "Effects of Electric Shock on Man" by Prof. Charles F. Dalziel. Reprinted from I.R.E. Transaction on Medical Electronics - May 1956 (PGME-5). (Available from βeta Electric Corp.).

5: Set the METER POLARITY selector switch "+" or "-", corresponding to the setting of plugs and jacks in the high voltage section, per Section III, A, 5.

6: Set OUTPUT VOLTAGE AND OUTPUT CURRENT METER range selector switch to the range desired.

7: Set the MAIN POWER switch to ON.

8: Set the OVERLOAD TRIP CONTROL to the desired trip current. Refer to drawing βa-1000-5 for the calibration of trip current vs. overload trip control setting. TRIP-RANGE IS 3.5 MA TO 5 MA (DO NOT SET HIGHER THAN 4 MA-SEE DIAL CALIB CHART

9: Set the HIGH VOLTAGE CONTROL to zero. ~~(Recommended, but not~~ (mandatory).

Depress the HIGH VOLTAGE ON pushbutton.

a: For high voltage surge, also depress the ZERO START INTERLOCK BYPASS pushbutton. Keep button depressed until the "overload" pilot light I4 is extinguished.

10: Turn the HIGH VOLTAGE CONTROL clockwise until the rated output voltage and/or current is indicated.

11: TURN OFF: PROCEEDURE

a: Turn the HIGH VOLTAGE CONTROL to zero (advisable, not mandatory).
b: Depress the HIGH VOLTAGE OFF pushbutton.
c: SET the MAIN POWER switch to OFF. (FOR COMPLETE TURNOFF OF H.V. SYSTEM ONLY)

NOTE: Allow the OUTPUT VOLTAGE meter to fall below 5% of rated voltage, (AFTER SYSTEM) before depressing the HIGH VOLTAGE OFF pushbutton. This obviates the possibility of unexpected high voltage appearing when the high voltage on pushbutton is again depressed. Further, it minimizes arcing at the automatic output shorting mechanism with consequent contact deterioration.

**** In case of emergency, there should be no hesitation to depress the HIGH VOLTAGE OFF pushbutton atonce.

12: TO RESET AFTER AN OVERLOAD: **
a: Remedy the condition that caused the overload.
b: Turn the HIGH VOLTAGE CONTROL to zero.
c: Depress the OVERLOAD RESET pushbutton.
d: Repeat steps 8 through 10 above.

** All power supplies have a protective spark gap. It will fire if the output voltage is raised approximately 10% above the rated maximum, and will cause an overload to be indicated. THE METERS ARE PROTECTED AGAINST OVERLOADS ON ALL RANGES.

* * * *

SECTION IV - THEORY OF OPERATION

All of the circuits and functions of the power supply are quite straightforward and can be readily understood by reference to the basic schematic circuit diagram, βc-1000-1 herewith. (See note in Section V re drawing nomenclature). βc-1030-20-R&D-3

Main ac power and dc circuits are indicated heavily. Light lines represent circuits for controls, meters, filtering or indicating devices. The detailed replacement parts list herewith describes the function of each component.

Several novel features, introduced in 1946 and pioneered by βeta Electric, are briefly outlined herewith. In addition, unusual circuit features are described:

1: BLOWN FUSE AND OPEN SWITCH INDICATORS:

Neon glow lamps, such as I1, shine when the paralleled fuse is blown, or paralleled switch is open, thus indicating immediately the cause of inoperation of the power supply. The lamp holders have built-in resistors, limiting the lamp current to approximately 1 milliampere, so that none of the circuit BEYOND THE LAMP will be operated by the small current that flows through the lamp.

2: NEON PILOT LIGHT CURRENT RETURN RESISTORS:

Resistors such as R1 ensure illumination of the adjacent neon glow lamp in case of blown fuse or open switch paralleled by the indicator and an open circuit beyond the resistor.

3: HOLDING RELAY FOR OVERLOAD PROTECTION:

Relay K1 pulls in when contacts 3a of the overload relay K3 close momentarily. When K1 is energized, contacts 1b open, de-energizing all of the high voltage circuits; also, contacts 1a close and maintain K1 energized, even though contacts 3a have now opened up, due to contacts 1b having opened, and having removed primary power from the high voltage circuit, thus eliminating the overload condition. Depressing S1, HIGH VOLTAGE OFF & OVERLOAD RESET, de-energizes K1 and resets the system for operation after the overload.

Pilot light I4, OVERLOAD, is illuminated for the overload condition.

4: HIGH VOLTAGE "HOLDING":

When the HIGH VOLTAGE ON pushbutton S2 is depressed, solenoid K2 is energized, removing the short from the output, through resistor R5. At the same time, K4 is energized, closing contact 4c, thus bypassing S2 and allowing S2 to be released, maintaining high voltage.

5: HIGH VOLTAGE GENERATING CIRCUITS:

The high voltage is controlled by the output of covat T1, which varies

from 0 to 135 volts, the ac input voltage to the high voltage transformer T2.

The output of T2 is rectified by means of rectifiers and filters in a circuit that is most economical for the particular application. The circuits employed are:

a) Full-wave doubler ~~(most common)~~ *
~~b) Full-wave rectifier (for high current)~~

6: POLARITY REVERSAL:

The high voltage is made (positive or) negative with respect to ground by means of reversing the sense of the rectifiers. This reversal is accomplished by means of plugs and jacks located on a shelf in the high voltage section. (SEE DWG 1030-20-R&D-2)

7: METERING AND OVERLOAD CIRCUITS:

The output voltage metering circuit consists of resistor R4 in series with meter M1, OUTPUT VOLTAGE, and the series (R6) and shunting (R11, R12, and R13) calibrating resistors.

It is to be noted that the return of the output voltage metering circuit is not to ground, but to the "high" end of the OUTPUT CURRENT metering circuit M2. Thus, the output current meter does not indicate the current drawn by the kilovoltmeter circuit.

In series with the OUTPUT CURRENT meter M2 is the overload relay K3. This relay is calibrated to ensure pull in at the rated currents.

Capacitor C5 allows the relay K3 to pull in on average current, rather than the large peak currents that flow through the rectifier circuit.

* * * *

SECTION V - DRAWING NOMENCLATURE CONTINUED

Bc1030-20-R&D-1

1: ~~βc-1000-R&D-1,~~ a schematic circuit diagram of the entire power supply. The power and high voltage dc circuits are indicated with heavy lines. Electrical specifications for the particular power supply are tabulated thereon.

Bc1030-20-R&D-2

2: ~~βb-1000-R&D-2~~, showing parts placement on the control panel and chassis, and in the high voltage section. Mechanical specifications of the particular power supply are tabulated thereon.

Ac1030-20-R&D-3

3: ~~βc-1000-R&D-3~~, a schematic wiring diagram of the entire power supply. This is a point-to-point wiring diagram, indicating that all wires are number coded for ease of trouble shooting and component isolation, except in the high voltage section, or for short jumpers, readily traced, in the control section.

4: βa-1000-R&D-4, a calibration curve of the no load output voltage vs. the HIGH VOLTAGE CONTROL setting.

5: βa-1000-R&D-5, a calibration curve of the OVERLOAD TRIP CONTROL setting vs. the current at which the overload relay will pull in.

The below listed drawings will only be supplied for optional features:

6: βc-1000-7, a schematic wiring and parts placement drawing for the line voltage regulator (C2[illegible] feature)

1030-20-L2

7: ~~βb-1000-8~~, a schematic wiring diagram and parts placement drawing for the filter section. ([illegible], L2 feature).

* *

SECTION VI - SERVICE AIDS

I. CAUTION:

When trouble shooting, be certain that all personnel are properly placed with respect to the output cable. There are dangerous high voltages present in this supply and should be serviced ony by informed and skilled personnel.

II. ASSUMPTIONS:

A: The following tests apply only to the High Voltage section and assume that the control section is in operating condition.

B: This does not preclude the possibility that fuses are blown, circuit breakers are open or that the interconnecting cable (if any) is improperly connected.

C: The operation of the control section can be readily understood by referring to Schematic Circuit Diagram (1st drawing) and

1030-20-R&D-1

Schematic Wiring Diagram (3rd drawing). 1030-20-REV D-3

III. POWER SUPPLY TROUBLE VS. APPLICATION TROUBLE:

A. The first thing to determine is whether the difficulty is the βeta power supply or your application.

This can be determined by making the following tests:

1. LOAD DISCONNECT:

Disconnect output ~~cable from load~~ LOAD. (Hang output cable in air away from ground and all personnel. ONLY IF DISASSEMBLED FROM RACK)

2. NO LOAD TEST:

Raise H.V. CONTROL on front panel until kilovoltmeter reads rated maximum output voltage. (30,000 V-DC (Leave on for approximately 1/2 hour). If trouble does not develop, then:

a) Turn HIGH VOLTAGE CONTROL to zero. Turn unit off.

3. SHORT CIRCUIT TEST:

Connect output cable tip (H.V. end) to ground. Turn overload trip control on front panel full clockwise. Raise HIGH VOLTAGE CONTROL on front panel very slowly until ~~rated~~ output current OF 10MA is read. (Leave on for approximately 1/2 hour). A small rotation (approximately 10%) of the HIGH VOLTAGE CONTROL should give full current. Turn unit off.

B. If the above tests show normal power supply operation, the trouble is most likely in your load application. We suggest you contact our representative in your area for assistance.

C. If power supply operation is not normal, then proceed as follows:

(1) If the NO LOAD TEST is satisfactory, and the SHORT CIRCUIT TEST is not, refer to Trouble Shooting Section V.

(2) If the SHORT CIRCUIT TEST is satisfactory, and the NO LOAD TEST is not, refer to Trouble Shooting Section VI.

(3) If flashing or arc-over occurs in the High Voltage section before rated output voltage is obtained in the NO LOAD TEST, refer to Trouble Shooting Section IV.

(4) If no output voltage or current is obtained in the NO LOAD TEST and the SHORT CIRCUIT TEST, refer to Trouble Shooting Section VII.

IV. FLASHING IN HIGH VOLTAGE SECTION:

NOTE: Overload relay may trip after flashover. This can be determined by pilot light on front panel.

PROBABLE CAUSE	REMEDIAL ACTION
IMPROPER LOAD:	
Load may be open or acring to ground.	Remove load and check unit at no load.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
** OIL AERATION:	
This usually occurs when High Voltage section is untanked frequently. Entrapped air will cause some loss of insulation properties of oil.	Before raising output voltage, allow frame to set in oil approximately 1 hour to remove major air pockets. Unit may be operated at 1/2 voltage to help drive out excess air.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
** INSUFFICIENT OIL:	
Oil level must be approximately 1/2" from top of tank cover.	Fill oil to approximately 1/2" from top of tank cover with the frame in place.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
** CONTAMINATED OIL:	
This will lower the dielectric strength of the oil.	Filter or replace oil.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
BROKEN LEAD(s):	
Leads may be disconnected and cause arcing.	Inspect High Voltage section for broken leads on transformers tubes, capacitors, etc. (INSPECT OUTPUT CURRENT LIMITING RESISTORS FOR OPENS) (I.E. IN L2 FILTER SECTION AND ON OUTPUT CURRENT-LIMITER PANELS)
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *

** Oil insulated units only.

PROBABLE CAUSE	REMEDIAL ACTION
Overvoltage gap not set properly. (where spark gaps are used).	Should be set so that overload trips at approximately 10% overvoltage. (WHERE L2 FILTER SECTION IS USED, CONSIDERAB REGULATION EXISTS)
* * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *
FOREIGN MATTER IN HIGH VOLTAGE SECTION:	
Objects such as screws, nuts, bits of metal floating above ground potential may cause arcing.	Inspect for foreign matter such as nuts, screws, pieces of wires etc. wedged in frame or cabinet. Remove.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *
** Output cable not seated properly.	Check to see that cable plug mates properly with jack.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * *

** IF the cause of flashing is not eliminated by any of the above remedial actions it will be necessary to remove ~~the frame~~ from the tank and raise the ~~output voltage~~ to 1/3 rated output voltage in air: DO NOT RAISE ABOVE 1/3 ~~RATED VOLTAGE IN AIR~~. Watch for signs of corona and/or arcing as they usually indicate source of trouble. There are dangerous High Voltage present and extreme caution should be observed. (IE, 30,000 V.-D.C.)

* * * * * * * * * * * * * * * * * * * *

If above do not succed in locating the difficulty, remove the load and place a milliammeter between output and ground. Observe proper polarity. If current is read, the trouble is probably in the milliammeter circuit in the control section.

Notify our representative in your area for assistance if none of the above remedy your difficulty.

* *

VI. NO OUTPUT VOLTAGE (Output Current O.K):

Shorting wire across meter.	Inspect rear of control panel. Remove short.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
Calibrating potentiometers across meters shorted.	Check potentiometer for short with ohmmeter. Isolate circuit as required.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
Defective meter.	Check power supply meter against standard meter.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
Load shorted.	Check load.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *

VI. NO OUTPUT VOLTAGE (Output Current O.K.):

Output shorting mechanism binding or defective.	Check output shorting solenoid. This solenoid should be activated when the High Voltage ON button is depressed.
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *
Defective kilovoltmeter multiplier resistor(s).	Check resistance.(This is usually in the order of megohms)
* * * * * * * * * * * * * * * * * * * *	* * * * * * * * * * * * * * * * * * * *

If above do not succedd in locating the difficulty, remove load and place a kilovoltmeter from output to ground. Raise HIGH VOLTAGE CONTROL until meter reads. (The voltage read is limited by the capability of the external meter) If voltage is being generated, the trouble is probably in the kilovoltmeter circuit. Notify our representative in your area for assistance if none of the above remedy your difficulty.

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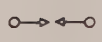
VII. NO OUTPUT VOLTAGE OR CURRENT:

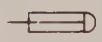
PROBABLE CAUSE	REMEDIAL ACTION
Shorting wires across milli-ammeter and kilovoltmeter.	Inspect rear of control panel. Remove short.
Tubes (if any) not in socket or defective.	Check for proper seating of tube in socket. Filaments should be lit. If not, check tubes and/or filament transformer(s).
Reversing plugs. Improperly connected or not connected.	Check for proper seating of reversing plugs.
High voltage transformer defective.	Check to see if any output voltage is obtained by placing an ac kilovoltmeter from the high end of transformer to ground.
High voltage transformer input fuse blown or circuit breaker open.	Replace fuse or close breaker. NOTE: The indicating lamp on the front panel will not light unless the HIGH VOLTAGE CONTROL is brought up to about 60 on the dial.

If none of the above remedy the difficulty, please call our representative in your area.

SECTION VII - SCHEMATIC SYMBOL DESIGNATION CHART

C CAPACITOR

E  SPARK GAP

E  STANDOFF INSULATOR

F FUSE

I NEON GLOW LAMP

I INCANDESCENT LAMP

J 2-POLE MALE RECEPTACLE

J 2-POLE FEMALE RECEPTACLE

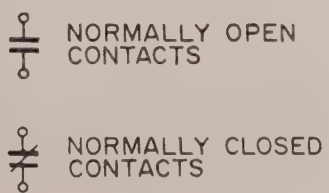
J 3-POLE MALE RECEPTACLE

J BANANA JACK; BINDING POST

J "AN" RECEPTACLE

J PHONE JACK

K RELAY



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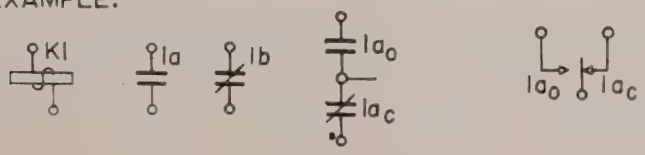
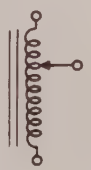
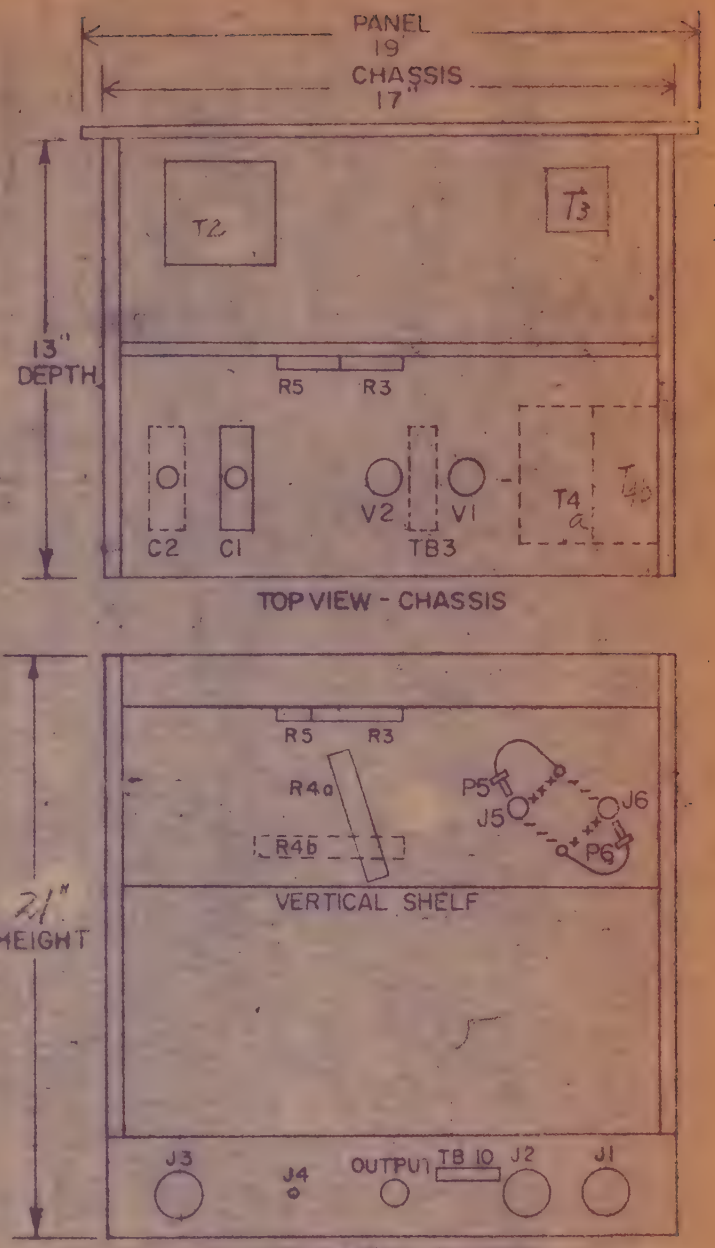
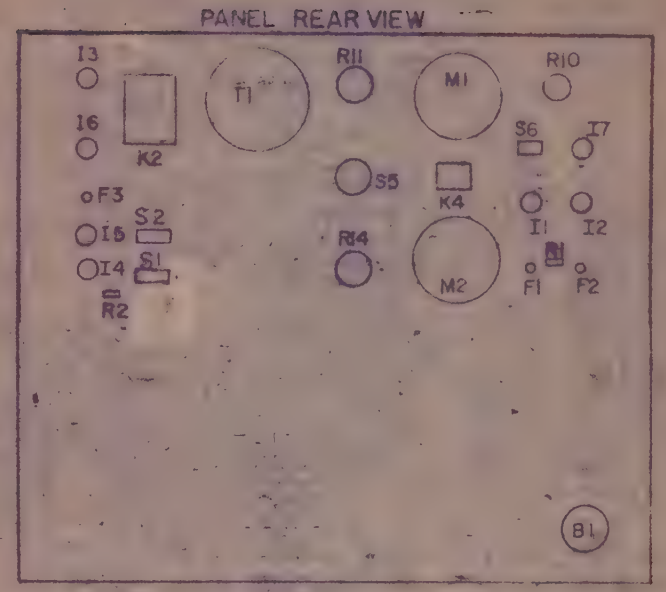


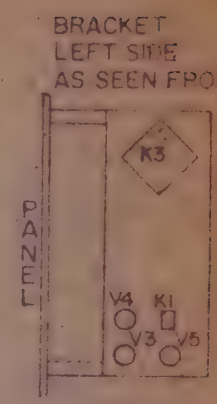
K SOLENOID RELAY

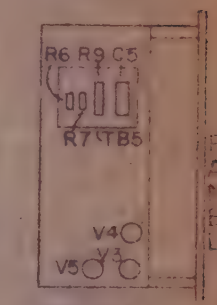
L		FILTER CHOKE
M		METER
P		BANANA PLUG
R		RESISTOR
R		POTENTIOMETER, RHEOSTAT
S		MOMENTARY CONTACT PUSHBUTTON, NORMALLY CLOSED
S		MOMENTARY CONTACT PUSHBUTTON, NORMALLY OPEN
S		TOGGLE SWITCH, MICRO-SWITCH, ETC., ROTARY SNAP SWITCH, ETC.,
S		ROTARY SELECTOR SWITCH, GANGED
T		TRANSFORMER
		COVAT
T		AUTO TRANSFORMER
W		INDICATES SHIELDED WIRE
W		WIRING TERMINAL
W		PHYSICAL CONNECTION (SOLDER, ETC.)

NOTE:
MANY SELF-EXPLANATORY SYMBOLS SUCH AS RECTIFIERS, AMPLIFIER TUBES, ETC., ARE NOT INCLUDED HEREIN.









MECHANICAL SPECIFICATIONS	
WIDTH PANEL	19"
WIDTH CHASSIS	17"
DEPTH	13"
FINISH PANEL	ALUM. BAKED ENAMEL
FINISH CHASSIS	GUNMETAL OPALESCENT
HEIGHT	21"
WEIGHT	

	REVISION	BY	DATE

PARTS PLACEMENT

DIMENSIONS IN INCHES
DO NOT SCALE

DRAWN BY KS 4/17/52

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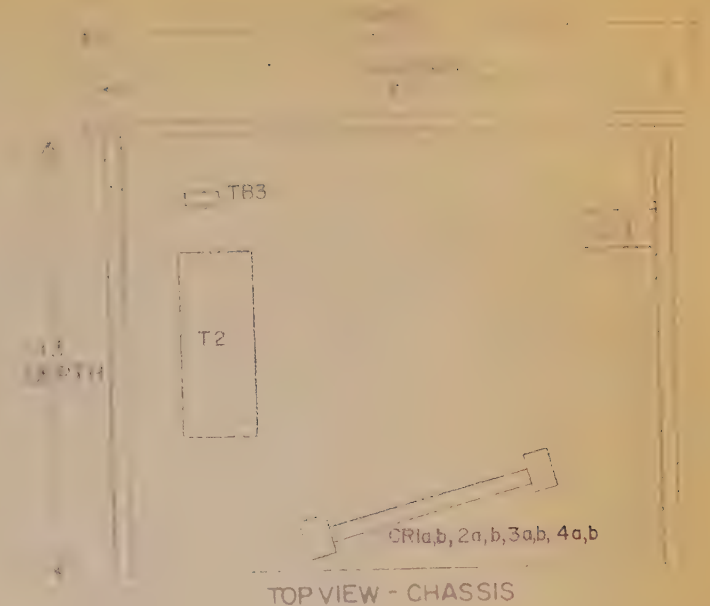
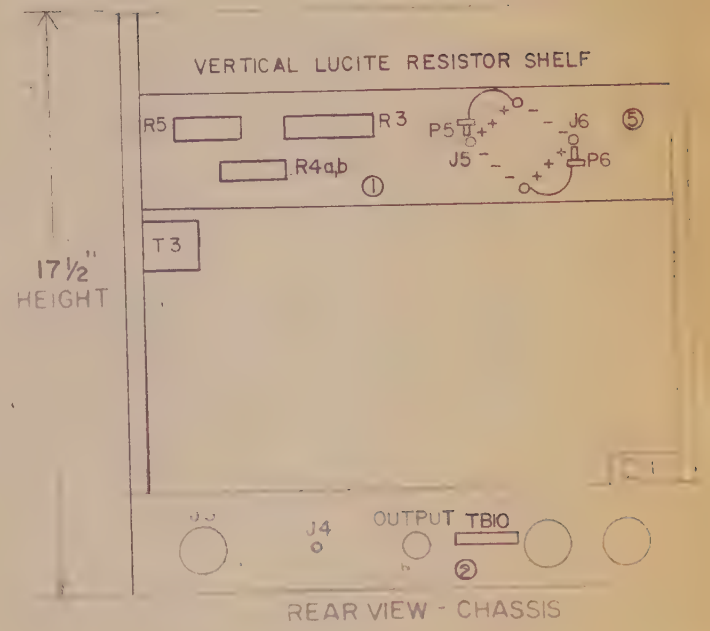
BETA ELECTRIC CORP
NEW YORK 29, N. Y.

1030-20R6D-2

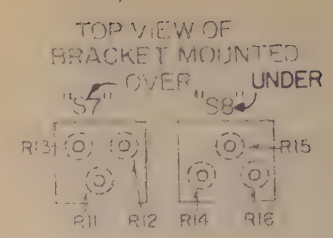


TOP VIEW - CHASSIS

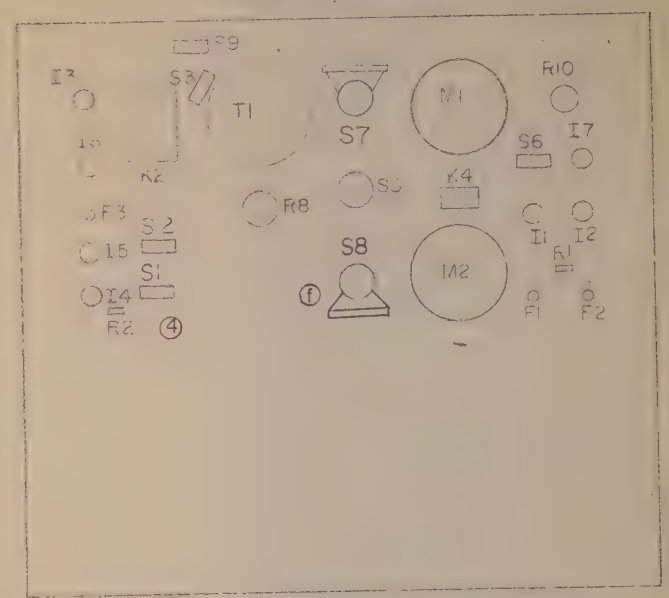


REAR VIEW - CHASSIS

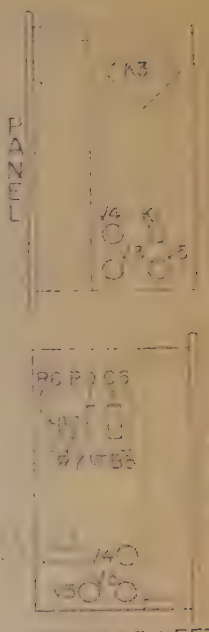
TOP VIEW OF
BRACKET MOUNTED
OVER "S7" UNDER "S8"



PANEL REAR VIEW



BRACKET RIGHT
SIDE VIEW



BRACKET LEFT
SIDE VIEW

	REVISION	BY	DATE
①	R4a,b RELOCATED	FR	5-1-57
②	TB10 ADDED	FR	5-1-57
③	S4 REMOVED	FR	5-1-57
④	R17 REMOVED	HC	8-1-57
⑤	FINISH FOR PANEL & CHASSIS CHNGD	HC	12-11-57
	LAYOUT OF PLUGS & JACKS REVISED	HC	12-11-57
⑥	REVISED POSITION OF POT BRACKET FROM ABOVE S8 TO UNDER S8	HC	5-29-58

PARTS PLACEMENT

DIMENSIONS IN INCHES
DO NOT SCALE

DRAWN BY SE 10/24/56

CHECKED BY

1015-10830-2

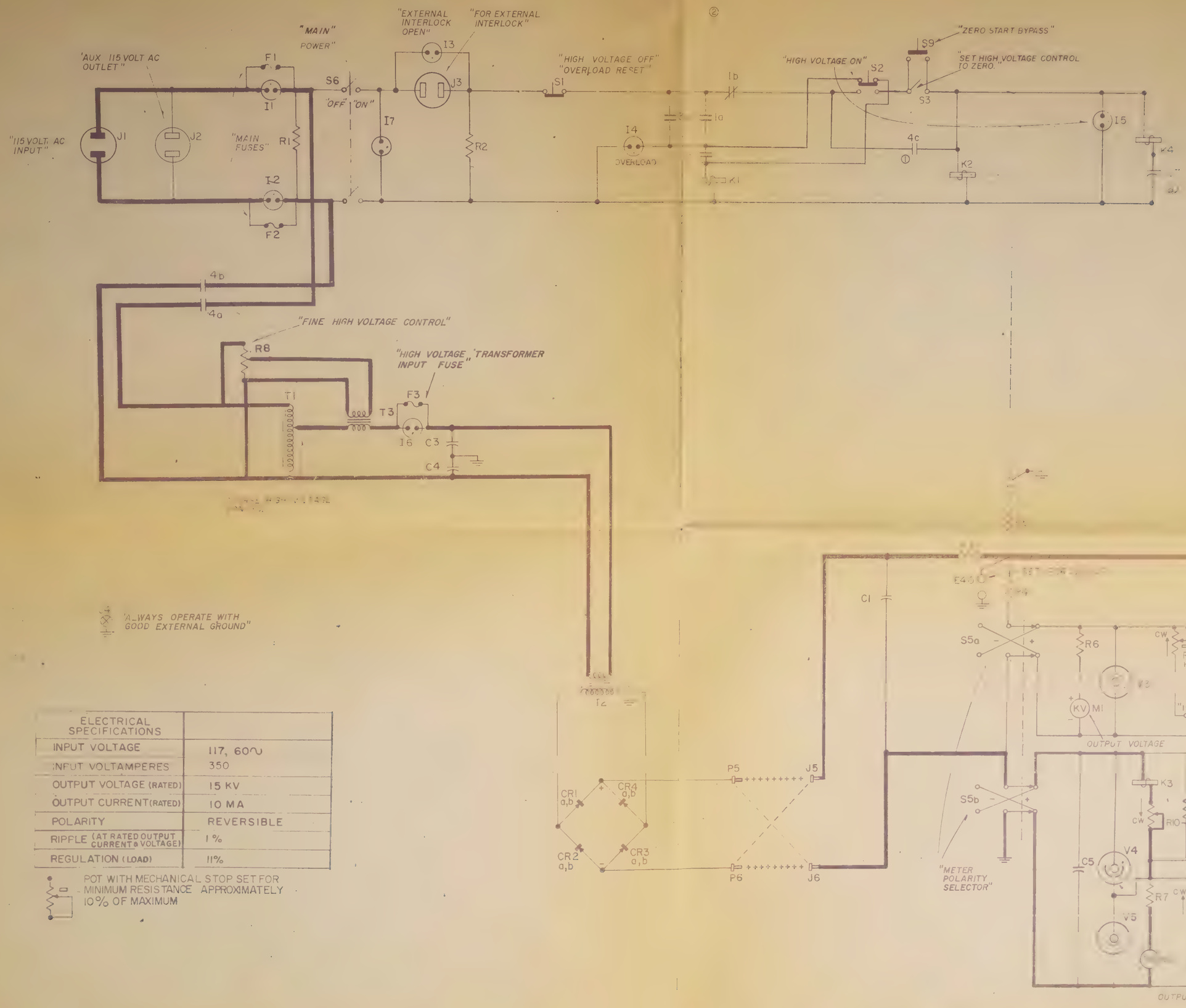
ALUMINUM BAKED ENAMEL
GUNMETAL OPALESCENT ⑤

17½"

75 LBS

⑤ ADDED CAPACITOR - C7
AS OF AND INCLUDING SER # 66/3939, F
DELIVERY C1a,b CHANGED TO C1

REVISION



ELECTRICAL SPECIFICATIONS	
INPUT VOLTAGE	117, 60~
INPUT VOLTAMPERES	350
OUTPUT VOLTAGE (RATED)	15 KV
OUTPUT CURRENT (RATED)	10 MA
POLARITY	REVERSIBLE
RIPPLE (AT RATED OUTPUT CURRENT & VOLTAGE)	1 %
REGULATION (LOAD)	11%

POT WITH MECHANICAL STOP SET FOR MINIMUM RESISTANCE APPROXIMATELY 10% OF MAXIMUM

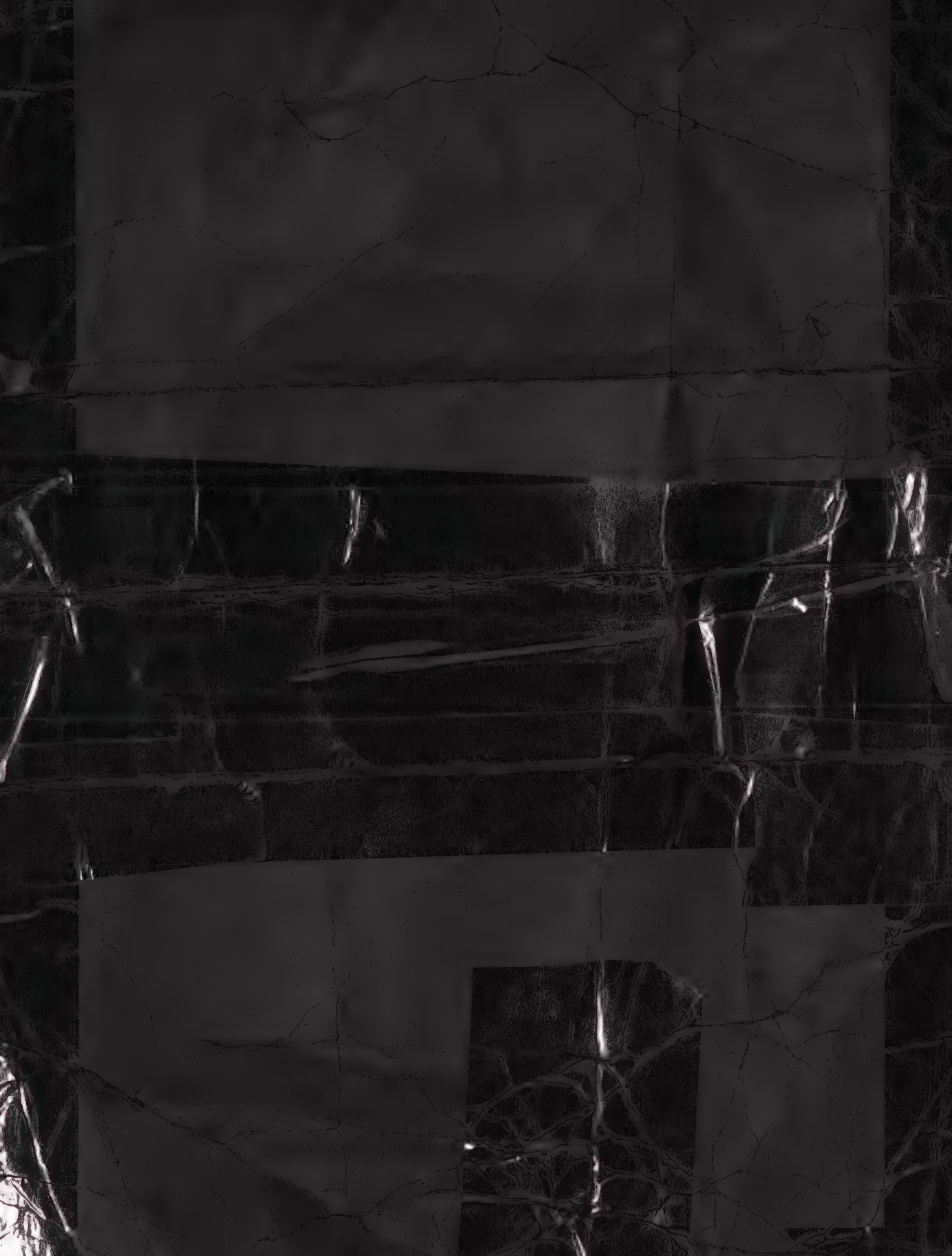
SCHEMATIC CIRCUIT DIAGRAM

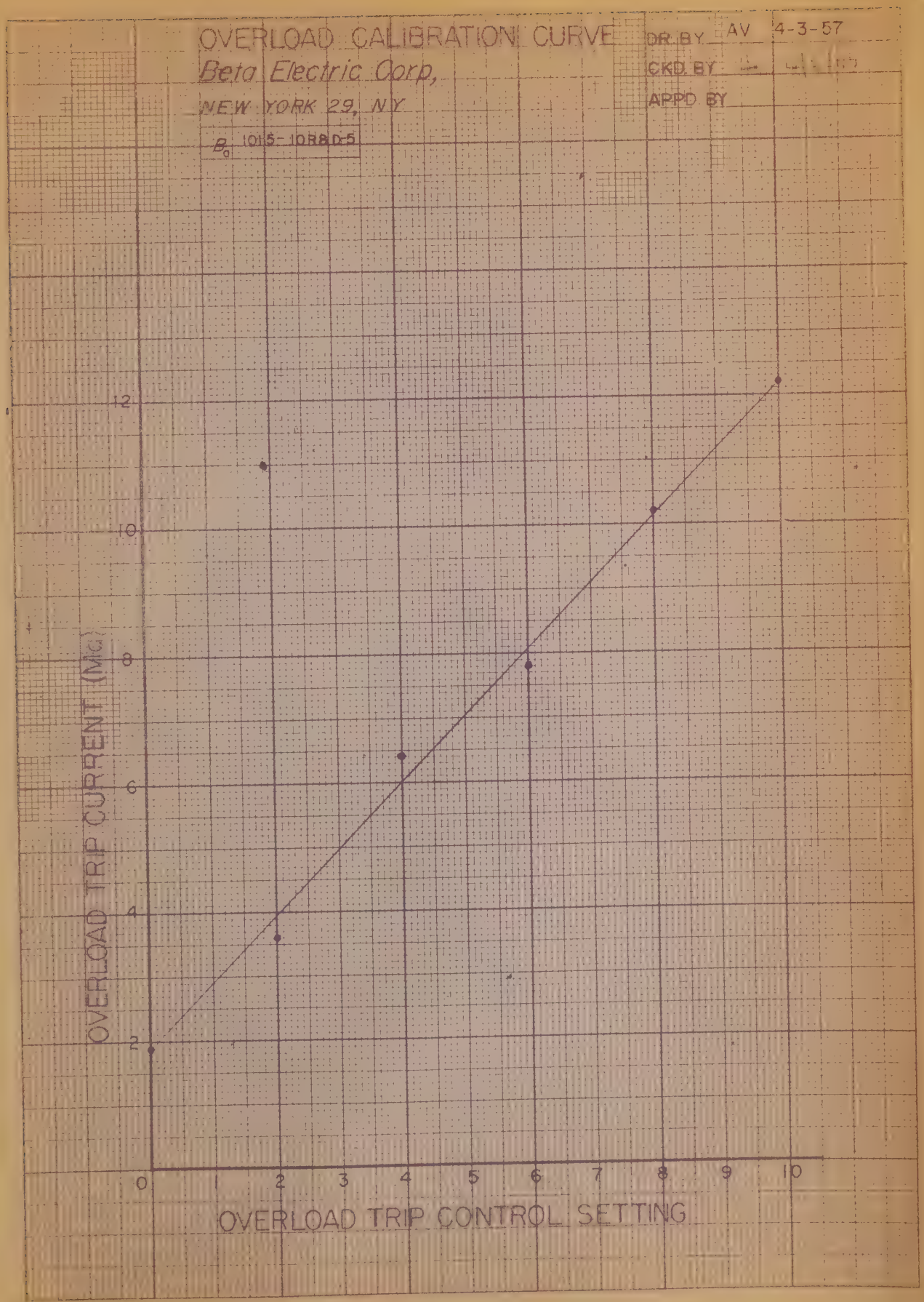
DIMENSIONS IN INCHES DO NOT SCALE

DRAWN BY SE 10/24/56

BETA ELECTRIC CORP
NEW YORK 25 N Y

105-10R5D-1



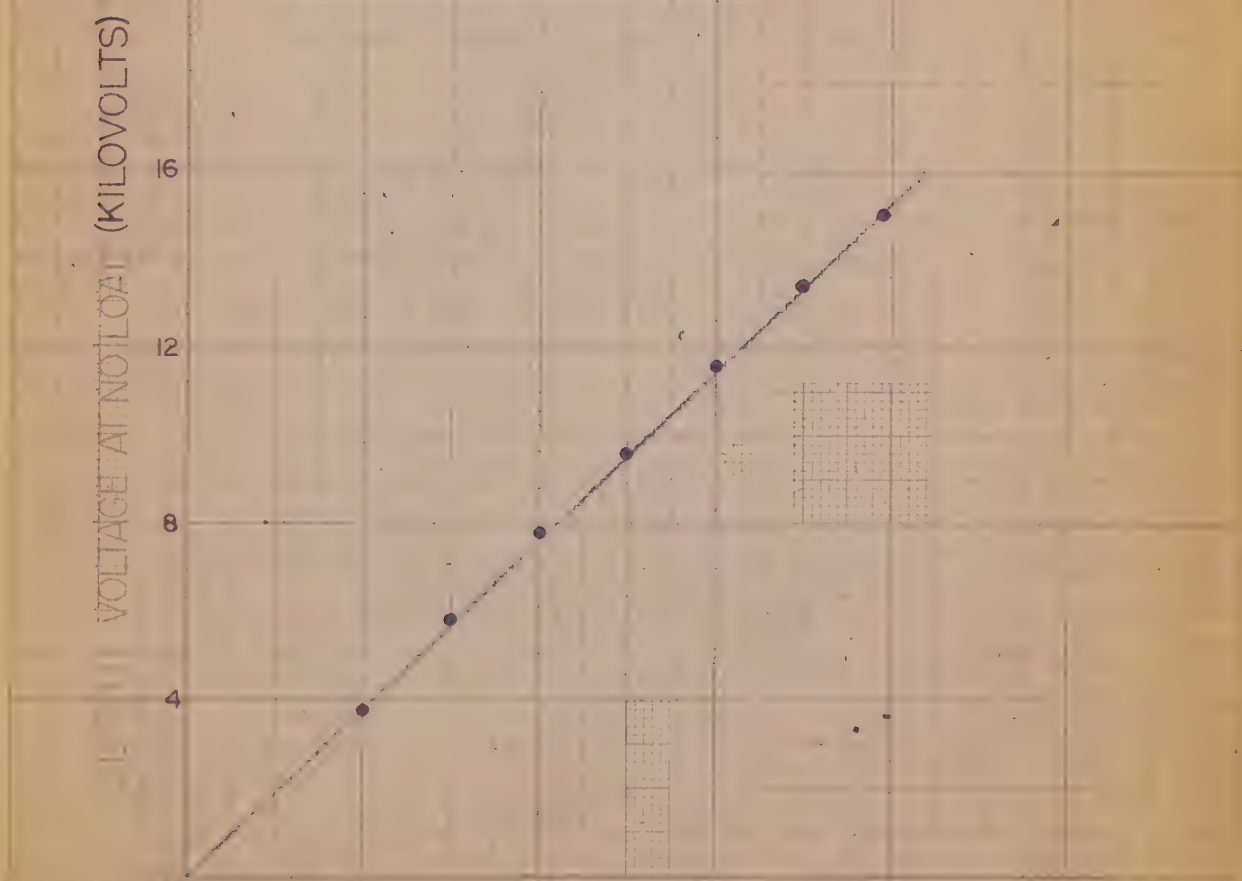


EUGENE DIETZGEN CO.
MADE IN U. S. A.
NO. 340A 20 DIETZGEN GRAPH PAPER
20 X 20 PER INCH

AS 10-31-55

1015 - 10R - 4
1015 - 10R&D - 4

117V



NO.	REVISION	BY	DATE
b			

DATE

TYPED BY hk

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BETA ELECTRIC CORP.

PARTS LIST. PAGE 1

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
			in relay rack designs.
A2	NOT USED		
A3	11A B4-11A-1000-17 1/2		and encloses panel and Mts. high voltage components, etc.
A4	22 8-3/8".		Filler panel.
A5	10-1015-10-5h (1 pc. lucite - 1/4 x 3 x 16-3/4).	Chassis	Resistor shelf.
A6	10-1015-10-5K (2 pcs. lucite - 1 x 1 x 9-7/8).	Chassis	Selenium mounting brackets.
A7	2-1015-10-5K (1 pc.	Chassis	Brace for s
C1	24-5321C 0.1 mfd, 15 kv	Chassis	Filter for high voltage.
C2	NOT USED		
C3,4	51C 0.01 mfd, 400 volts dc,	Chassis	RF noise suppressors.
C5	11C 1 mfd, 400 volts	Panel	Filter & bypass for peak currents on K3 and M2.
C6	NOT USED		
CT	24-6226 55C 0.5 mfd, 400V DC.	Panel	Booster capacitor.
E1a,b	407EB ICA #1282	Panel	H.V. on pushbutton switch cap. Zero start bypass pushbutton switch cap.
E2	407ER ICA#1282	Panel	H.V. off pushbutton switch cap.
E3	300E Heyman #SR-7P	Chassis	Output cable chassis bushing.
F1,2	8F 4 amperes	Panel	Main fuses.
F3	8F 3 amperes	Panel	H.V. transformer input fuse.
H1,2	77H Precision Metal #2102; with ferrule #2105.	Panel	
H3-6	NOT USED		
H9-11	NOT USED		
		Panel	Secures gas tubes.
			Mounts relays and VR tubes.

NO.	REVISION	BY	DATE

DATE

TYPED BY

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PARTS LIST. PAGE 2

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
I1-7	1I	Panel	Indicates as labelled.
J1	100J	Chassis	AC power input.
		Chassis	Aux. 115 volts ac output.
J7-20	NOT USED Birnbach #403	Chassis	Multiplier resistor connections.
		Panel	Overload holding relay.
			Control relay and [illegible]
			Overload relay.
			High voltage on relay.
M1	20M-19	Panel	Kilovoltmeter.
M2	20M-24	Panel	Milliammeter.
P1,2	NOT USED		
P3	105P Mueller #27	Cable	Output connector.
P4	NOT USED		
P5,6	6P E.F. Johnson #105-303	Chassis	Polarity reversal.
P7-20	NOT USED		
P21,22	51P Birnbach #401	Chassis	Mate with J21, J22.

spark gap surge suppressor.

NO.	REVISION	BY	DATE

DATE 10/30/56
TYPED BY nk
CHECKED BY
APPR'D BY

BETA ELECTRIC CORP.

PARTS LIST PAGE

	PART NO.	BETA CODE NO. AND DESCRIPTION		LOCATION	FUNCTION
	R12	10R	500k	Panel	Calib. for next lower range of M1.
	R13	10R	1 megohm	Panel	Calib. for lowest range of M1.
	R14	10R	10k	Panel	Calib. for highest range of M2.
	R15	10R	50k	Panel	Calib. for next lower range of M2.
	R16	10R	50k	Panel	Calib. for lowest range of M2.
	R17	[illegible] NOT USED		Panel	Prev. residual sticking of solenoid.
	R18-21	NOT USED			
(2)	R22 a,b	[illegible] NOT USED			Voltage dividers.
	S1	5S	A-H&H #3392A	Panel	H.V. off and overload reset switch.
	S2	5S		Panel	High voltage on switch.
	S3	17S	Microswitch #BZ-2RL-A2	Panel	Zero start interlock, -Z feature.
	S4 NOT USED	[illegible]		Panel	Holding switch - high voltage on.
	S5	8S	Centralab #2514	Panel	Meter polarity selector -R feature.
	S6	4S	A-H&H #80600	Panel	As labelled.
	S7	7S	Centralab #2504	Panel	Meter range selector, V2,V3 features
	S8	7S	Centralab #2504	Panel	Meter range selector, M2,M3 features
	S9	5S	A-H&H #3392A	Panel	Bypass for zero start interlock, N4b
	T1	505T	300BU	Panel	Coarse high voltage control.
	T2	322T		Chassis	High voltage transformer.
	T3	200T	UTC #S-53.	Chassis	Fine injection voltage transformer.
	V1,2	NOT USED			
	V3	15V	VR75(0A3)	Panel	Surge protector.
	V4	19V	VR105(0C3)	Panel	Surge protector.
	V5	15V	VR75(0A3)	Panel	Surge protector.
	W1	2W	RG 8/U coaxial cable, 8'	Chassis	Output cable.
	W2	1W	6 ft., 2 con'r.	Chassis	AC line cord.
	XF1,2	1XF		Panel	Main fuse holders.
	XF3	1XF		Panel	H.V. transformer input fuse.
	XI1-7	1XI-		Panel	Hold respective pilot lights.

NO	REVISION	BY	DATE

Model 1015-10R&D Power Supply INTERNAL MASTER

DATE 10/30/56

TYPED BY:

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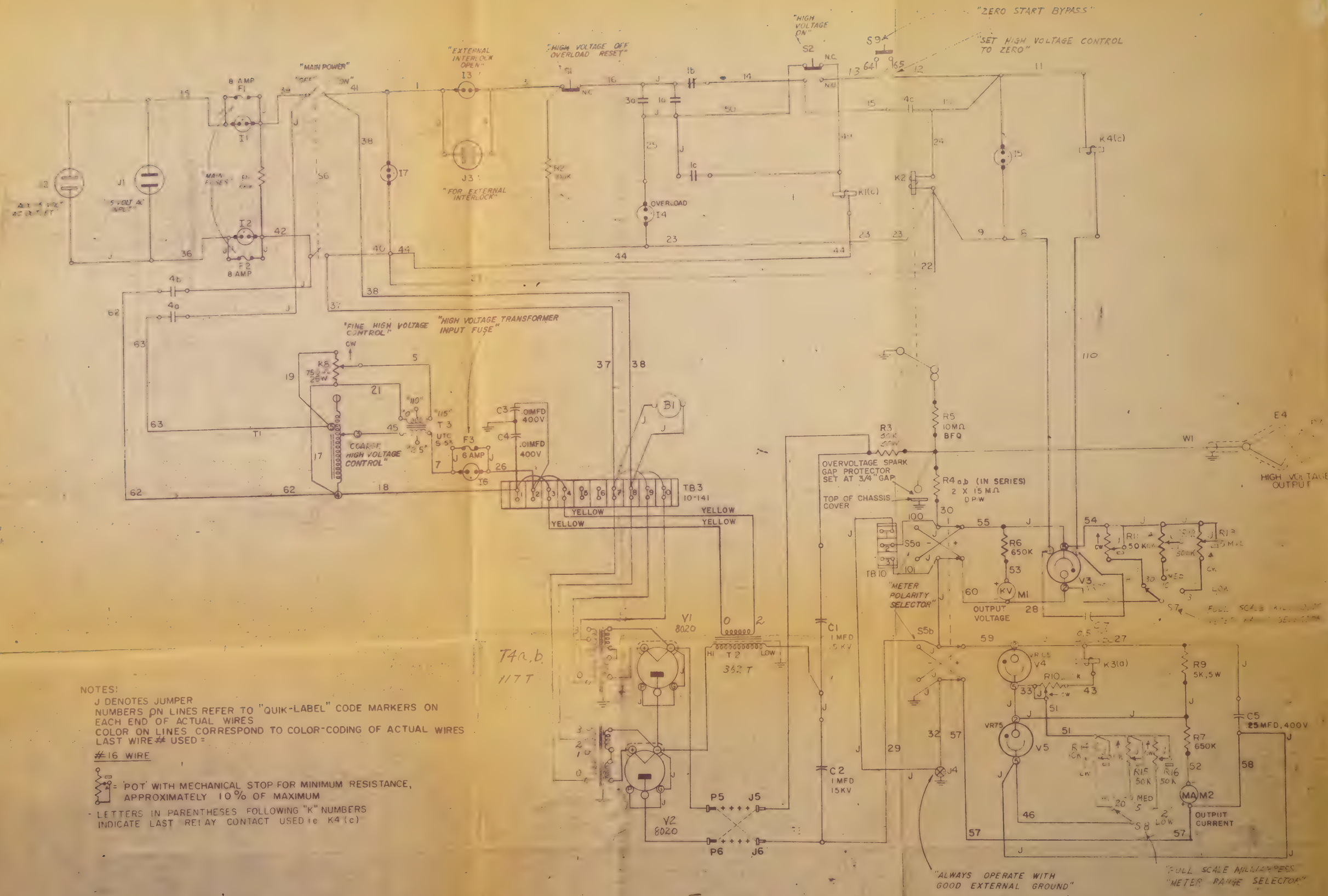
BETA ELECTRIC CORP.

PARTS LIST PAGE

	PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
	XV1,2	NOT USED		
42-147	XV3-5	2XV	Panel	Surge protector sockets.
26-745	CR1a,b,2a,b 3a,b,4a,b	7CR 5-9360	Chassis	High voltage rectifiers (8 total).
	TB1,2	NOT USED		
42-127	TB3	[illegible]	Chassis	Termination for H.V. filter [illegible]
	TB4	NOT USED		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] mounts components.
	TB6-9	NOT USED		
43-020	TB10	11TB3 With marker strip.	Chassis	Interconnector for filter section when used.



NOTES:

J DENOTES JUMPER

NUMBERS ON LINES REFER TO "QUIK-LABEL" CODE MARKERS ON EACH END OF ACTUAL WIRES

COLOR ON LINES CORRESPOND TO COLOR-CODING OF ACTUAL WIRES

LAST WIRE # USED =

#16 WIRE

= POT WITH MECHANICAL STOP FOR MINIMUM RESISTANCE, APPROXIMATELY 10% OF MAXIMUM

- LETTERS IN PARENTHESES FOLLOWING "K" NUMBERS INDICATE LAST RELAY CONTACT USED ie K4(c)

NO.	REVISION	BY	DATE

NO	REVISION	BY	DATE

SCHEMATIC WIRING DIAGRAM

DIMENSIONS IN INCHES
DO NOT SCALE

DRAWN BY KS 4/18/66

CHECKED BY A.S. 4-18-66

BETA ELECTRIC CORP
NEW YORK 29, N. Y.

1030-20R x D-3

NO	REVISION	BY	DATE

MODEL 1030-20 R&D

DATE 4/18/60

TYPED BY hk

CHECKED BY KS 4/60

APP'D BY

BETA ELECTRIC CORP.

PARTS LIST. PAGE 1

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
A1	22A β-c-22A-1000-8 3/4		Mtg. panel for controls and meters, in relay rack designs.
A2	NOT USED		
A3	11A β-c-11A-1000-21		Mts. high voltage components.
A4	13A β-13A-1000-21		Encloses chassis & panel components.
A5,6	NOT USED		
A7	~~52A β-c-52A-1000-21~~ NOT USED		Insulated post for output shorting mechanism.
A8	24A 12-1/4		FILLER PANEL
B1	15B Blower, Redmond MTR #BL80.	Chassis	Ventilation of chassis.
C1,2	21C .1 mfd, 15 kv	Chassis	Filter for high voltage.
C3,4	51C 0.01 mfd, 400 volts dc Micamold #339BE110.	Chassis	RF noise suppressors.
C5	10C .25 mfd, 400 volts	Panel	Filter & bypass for peak currents on K3 and M2.
E1	407EB ICA #1282	Panel	H.V. On pushbutton switch cap.
E2	407ER ICA #1282	Panel	H.V. Off pushbutton switch cap.
E3	300E Heyman #SR-7P	Chassis	Output cable chassis bushing.
E4	4E Mueller #29, red	Cable	Insulator for output connector.
E5-7	NOT USED		
E8 a-e	443E Raytheon Knobs	Panel	Adjustment control knob for R feat.
E9-21	NOT USED		
E22	410E 3/4" bronze balls	Chassis	Shorting mechanism target.
E23-26	410E 3/4" bronze balls	Chassis	Shorting mechanism targets.
E27	410E 1" bronze ball	Chassis	H.V. capacitor anti-corona ball.
E28,29	1E Anti-corona tube shield	Chassis	For V1,2.
E30-39	NOT USED		
E40	Per β-a-40E	Chassis	Overvoltage spark gap assembly.
E41	56H Mallory RB249	Chassis	Pot. Bracket.
F1,2	8F 8 amperes	Panel	Main fuses.
F3	8F 6 amperes	Panel	H.V. xfmr input fuse.

NO	REVISION	BY	DATE

Model 1030-20 R&D

DATE 4/18/60

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BETA ELECTRIC CORP.

PARTS LIST. PAGE 2

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
H1,2	77H Precision Metal #2102; with ferrule #2105.	Panel	Handles.
H3,4	NOT USED		
H5a,b	55H β-a-55H-1000-1	Panel	Mts. meter calib. pots, R11 & R14.
H6	NOT USED		
H7	55H β-a-55H-1000-8	Panel	Mounts solenoid and microswitch.
H8-11	NOT USED		
H12-14	43H Birtcher #926A	Panel	Secures gas tubes.
H15	55H β-a-55H-1000-10	Bracket H15	Mounts relays and VR tubes.
H16-18	NOT USED		
H19a,b	43H Birtcher #926C	Chassis	For V1,2.
I1-7	1I	Panel	Indicates as labelled.
J1	100J	Chassis	AC power input.
J2	101J	Chassis	Aux. 115 Volts ac outlet.
J3	101J	Chassis	External interlock connector.
J4	111J ICA #631	Chassis	External ground connection.
J5,6	62J E.F.Johnson #105-703	Chassis	Polarity reversal.
J7-10	51J. Birnbach #403	Chassis	Mounts R4a,b.
K1	24K P&B #KP11A	Bracket H15	Overload holding relay.
K2	36K Allen-B #860BOD106A.	Panel	Hold-On relay and output shorting.
K3	12K Kurman type BK35.	Bracket H15	Overload relay.
K4	5K Leach type 1127	Panel	High voltage on relay.
M1	20M-20 labelled 0/3/10/30KVDC	Panel	Kilovoltmeter.
M2	20M-31 labelled 0/2/5/20MADC	Panel	Milliammeter.
NP1	7NP-2		
P1,2	102P National SPP-9	Chassis	Tube cap.
P3	105P Mueller #27	Cable	Output connector.
P4	NOT USED		
P5,6	63P E.F.Johnson #105-303	Chassis	Polarity reversal.
P7-10	51P Birnbach #401	Chassis	Mates with J7-10.

NO	REVISION	BY	DATE

Model 1030-20 R&D

DATE 4/18/60

TYPED BY hk

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BETA ELECTRIC CORP.

PARTS LIST. PAGE 4

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
X I1-7	1XI	Panel	Hold respective pilot lights.
XV1,2	3XV	Chassis	High voltage rectifier sockets.
XV3-5	2XV	Bracket H15	Surge protector sockets.
TB1,2	NOT USED		
TB3	1TB 10		Termination for H.V. xfrmr primary.
TB4	1TB 4		Termination for filament xfrmr primary.
TB5	4TB Precision Prods. #2604	VR tube bracket.	Mounts components.

NO.	REVISION	BY	DATE

Model 1030-20 R&D

DATE

TYPED BY: hk

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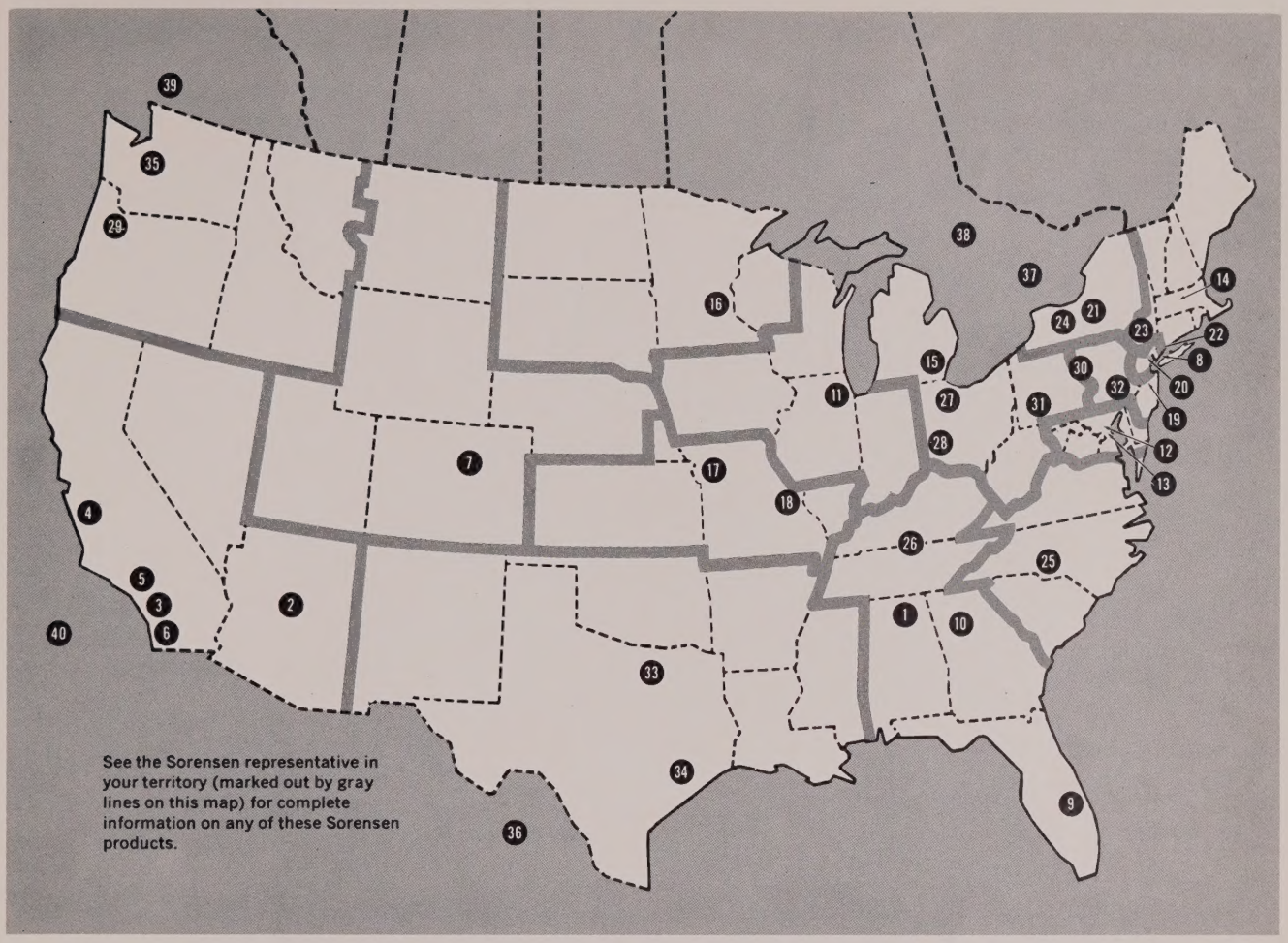
BETA ELECTRIC CORP.

PARTS LIST. PAGE 3

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
R1,2	1R 100k/10/1	Panel	Neon pilot light return current path.
R3	6R 50k 50W	Chassis	Short circuit current limiter.
R4a,b	4R 15M, DPW 15	Chassis	Kilovolt meter multiplier.
R5	4R 10M, BPQ 15	Chassis	Shorting mechanism and overvoltage spark gap surge suppressor.
R6	2R 650k	Panel	Fires V3 at exc. M1 current.
R7	2R 650k	Panel	Fires V5 at exc. M2 current.
R8	NOT USED		
R9	6R 5k/5W	Panel	Coarse calib. for overload relay.
R10	10R 500K W 1/2	Panel	Fine overload calibrator (K3.)
R11	10R 50k	Panel	Calibrator for M1.
R12,13	NOTUSED		
R14	10R 10k	Panel	Calibrator for M2.
R15,16	10R 50K W2		
R17	6R 5k w 5	Panel	Prev. residual sticking of solenoid.
S1	5S A-H&H #3392A	Panel	H.V. off and overload reset switch.
S2	5S A-H&H #3392A	Panel	H.V. on switch.
S3	NOT USED		
S4	17S Microswitch BZ-2RL-2	Panel	Holding switch - high voltage on.
S5	8S Centralab #2514	Panel	Meter polarity selector -R feature.
S6	4S A-H&H #80600	Panel	As labelled.
S7	7S Centralab #2504.	Panel	M1 meter range Selector.
S8	7S Centralab #2504	Panel	M2 meter range Selector.
T1	505T 500 BU	Panel	Coarse high voltage control.
T2	362T	Chassis	High voltage transformer.
T3	200T	CHASSIS	FINE INJECTION VOLTAGE TRANSFORMER
T4 A,B	117T	Chassis	Filament transformer.
V1,2	5V 8020	Chassis	High voltage rectifiers.
V3	15V VR75 (OA3)	Bracket H15	Surge protector.
V4	19V VR105 (OC3)	Bracket H15	Surge protector.
V5	15V VR75 (OA3)	Bracket H15	Surge protector.
W1	2W RG 8/U coaxial cable, 8 ft.	Chassis	Output cable.
XF1,2	1XF	Panel	Main fuse holders.
XF3	1XF	Panel	H.V. transformer input fuse.


See the Sorensen representative in your territory (marked out by gray lines on this map) for complete information on any of these Sorensen products.

1 ALABAMA — Huntsville *
Bivins & Caldwell, Inc.
JEfferson 2-5733

2 ARIZONA — Phoenix *
McCarthy Associates
111 Osborn West, Suite 213
CRestwood 9-1891

3 CALIFORNIA — Hollywood
Sorensen's West Coast Warehouse
Bekins Warehousing Corp.
1025 No. Highland Ave.

4 CALIFORNIA — Menlo Park *
McCarthy Associates
635 Oak Grove Avenue
DAvenport 6-7937

5 CALIFORNIA — Pasadena *
McCarthy Associates
1055 E. Walnut
SYcamore 2-8272

6 CALIFORNIA — San Diego *
McCarthy Associates
934 W. Laurel Street
BElmont 9-4015

7 COLORADO — Denver 10 *
Lahana & Company
1886 South Broadway
PEarl 3-3791

8 CONNECTICUT — Bridgeport *
Yewell Associates, Inc.
1101 East Main Street
FOrest 6-3456

9 FLORIDA — Orlando *
Bivins & Caldwell, Inc.
P. O. Box 6025
1226 E. Colonial Dr.
CHerry 1-1091

10 GEORGIA — Atlanta 5 *
Bivins & Caldwell, Inc.
3133 Maple Drive, N. E.
CEdar 3-7522

11 ILLINOIS — Chicago 45 *
Pivan Engineering Co.
2820 Peterson Avenue
BRiargate 4-9135

26 KENTUCKY
Bivins & Caldwell, Inc.*
1923 N. Main Street
High Point, North Carolina
High Point 2-6873

12 MARYLAND — Baltimore 15 *
Horman Associates, Inc.
3006 W. Cold Spring Lane
MOhawk 4-8345

13 MARYLAND — Rockville *
Horman Associates, Inc.
941 Rollins Avenue
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14 MASSACHUSETTS — Burlington *
Yewell Associates, Inc.
Middlesex Turnpike
BRowning 2-9000

15 MICHIGAN — Detroit 35 *
S. Sterling Co.
15310 W. McNichols Rd.
BRoadway 3-2900

16 MINNESOTA — Minneapolis 3 *
Pinkney & Hine Company
1925 Nicollet Avenue
FEderal 8-0523

17 MISSOURI — Kansas City 30
Harris-Hanson Co.
7916 Paseo Avenue
HIghland 4-9494

18 MISSOURI — St. Louis 17
Harris-Hanson Co.
2814 S. Brentwood Blvd.
MIssion 7-4350

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905 Main Street
KEllogg 1-3150

20 NEW JERSEY — Englewood *
RMC Associates, Inc.
391 Grand Avenue
LOwell 7-3933

21 NEW YORK — Dewitt*
J. D. Ryerson Associates, Inc.
111 Kinne Road
Syracuse—GIbson 6-1771
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James L. Highsmith Co.
3733 Monroe Rd.
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27 OHIO — Cleveland 24 *
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28 OHIO — Dayton 2 *
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29 OREGON — Portland 9 *
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1238 N. W. Glisan Street
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30 PENNSYLVANIA — Camp Hill *
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2120 Market Street
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31 PENNSYLVANIA — Pittsburgh 27 *
S. Sterling Co.
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TUxedo 4-5515

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7404 West Chester Pike
FLanders 2-7017

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33 TEXAS — Dallas 9*
Earl Lipscomb Associates
P. O. Box 7084
FLeetwood 7-1881

34 TEXAS — Houston 5 *
Earl Lipscomb Associates
P. O. Box 6646
3825 Richmond Avenue
MOhawk 7-2407

35 WASHINGTON — Seattle 9*
ARVA, Inc.
1320 Prospect Street
MAin 2-0177

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48 Sparks Street
Ottawa, Ontario, Canada
CEntral 2-9821

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355 Burrard St.—Room G7
Vancouver 1, B. C.
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40 HAWAII
GENE PIETY FACTORS, INC.
2030 Home Rule Street
Honolulu 17, Hawaii
Phone 83105

**These representatives have service facilities.*

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SORENSEN & COMPANY, INC.

Richards Avenue, South Norwalk, Connecticut

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